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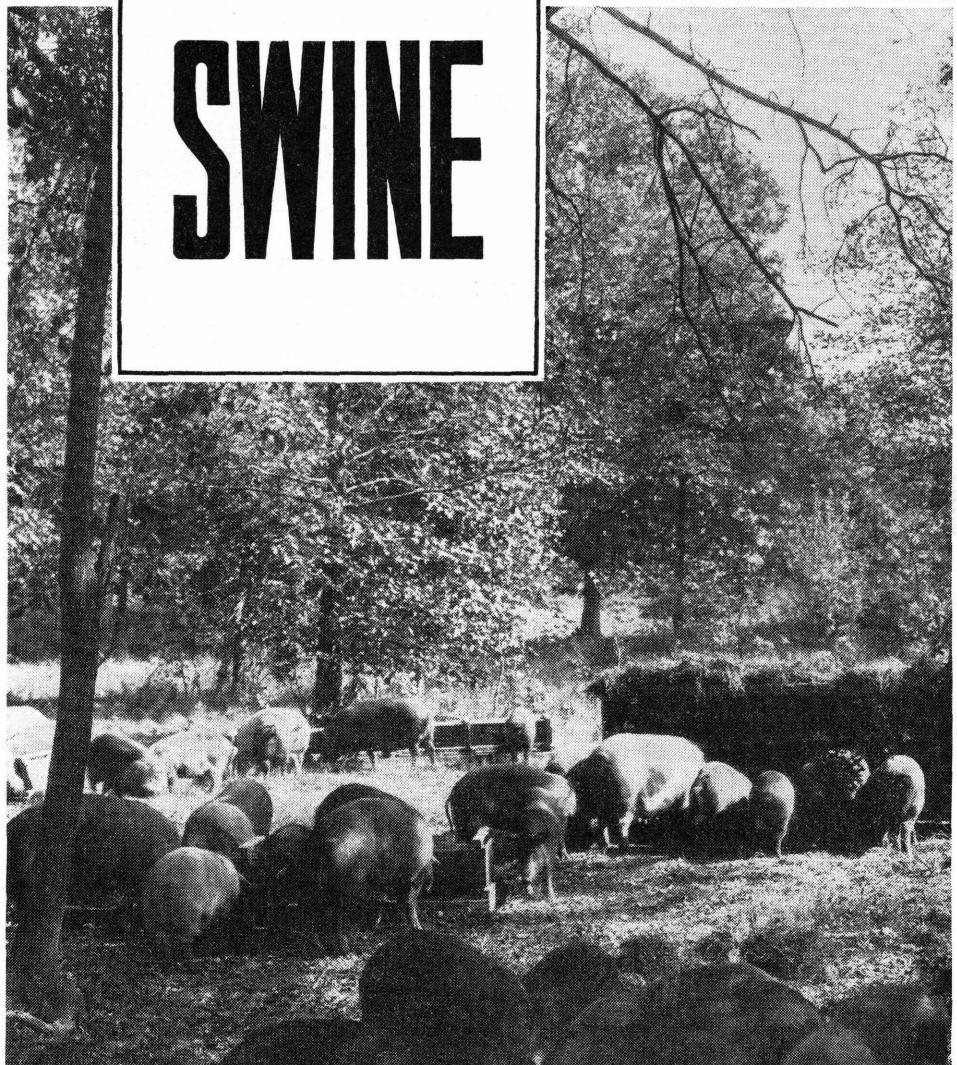
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# DISEASES OF SWINE

FARMERS  
BULLETIN  
No.1914



U. S. DEPARTMENT OF AGRICULTURE

# DISEASES OF SWINE<sup>1</sup>

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## PREVENTION OF DISEASES

**S**WINE are subject to many diseases, some of which are readily communicable and may cause serious loss from high mortality and unthriftiness. They are also susceptible to infestation with different kinds of parasites, most of which live in various passages or organs within the body. Young pigs are most easily injured by such parasites, which take a part of the nourishment that would otherwise be used by the pig in putting on flesh. In addition, parasites may cause harm by sucking blood, causing mechanical obstructions, secreting toxins, and in some instances transmitting disease. Young animals that are heavily parasitized usually make unsatisfactory gains and become stunted in their development. Diseases and parasites should be kept out of the herd by preventive measures, which can be applied by the owner more economically and easily than attempts to cure.

The purpose of this bulletin is to familiarize swine owners with methods of preventing the common diseases of swine, as well as controlling them once they become established. The treatment of diseased animals should preferably be left to a veterinarian.

Most swine owners are interested primarily in having healthy animals that will finish for market at an early age, but even under the best conditions hogs are likely to sicken, and in all such circumstances there is need for correct diagnosis in order that effective treatment may be given. This is especially important in the case of communicable diseases that tend to spread throughout the herd. As a basis

<sup>1</sup> This publication supersedes Farmers' Bulletin 1244, Diseases, Ailments, and Abnormal Conditions of Swine by T. P. White.

for veterinary treatment or other control measures, swine owners should observe their animals frequently and closely so as to be familiar with all details of the case history, such as the kind and condition of feed, the feeding of uncooked meat scraps, the administration of home remedies, and anything that may affect the health of any animals in the herd. To conceal from the veterinarian information bearing on the source or symptoms of the disease may prevent a correct diagnosis.

Most diseases, ailments, and abnormal conditions of swine are preventable to a large degree. Prevention through sanitation is highly effective and economical. Especially in the Northern and Central States, provision for housing hogs properly during bad weather is essential for best returns. This is particularly true following immunization against a disease such as hog cholera where weakened resistance in an animal, caused by exposure, may result in what is known as a "poor take," or failure to provide adequate immunity. The shelter need not be expensive but should be located on well-drained ground and should be readily accessible for thorough cleaning and disinfection. In addition, it should have a tight roof, good ventilation without drafts,<sup>2</sup> and the bedding should be reasonably dry.

Correct feeding with products adequate in vitamin content or supplemented with required vitamins, free access to water at all times, and a good mineral mixture are important in preserving the health of swine. A suitable mineral mixture may be made with equal parts of bonemeal, ground limestone, and salt. The addition of 0.02 percent potassium or sodium iodide is recommended in so-called "goiter districts." This mixture should be kept before the hogs at all times. A separate Department publication on swine feeding<sup>3</sup> may be obtained upon request.

The idea that unthrifty swine require some tonic or conditioner is rapidly being given up. Well-informed and successful swine producers now realize that when unthriftiness occurs the most economical procedure is to direct their efforts toward finding the cause of the trouble so that specific remedial measures may be adopted. Many swine producers have found it advisable and profitable to consult a veterinarian in regard to unthriftiness in swine rather than to give them tonics.

Garbage feeding is a big problem in itself and requires special precautions under various conditions to prevent the introduction of disease among healthy animals in this way. Raw pork scraps may, and often do, contain the causative agents of various diseases of swine. It is generally considered that feeding uncooked pork scraps is a common method of spreading cholera. Further information on feeding garbage may be obtained from the United States Department of Agriculture.

Swine should not be given grain, garbage, or similar feed on the ground (fig. 1). Suitable feeding floors or platforms, preferably of concrete (fig. 2), and troughs of some nonabsorbent material that can be cleaned, washed, and disinfected frequently are recommended.

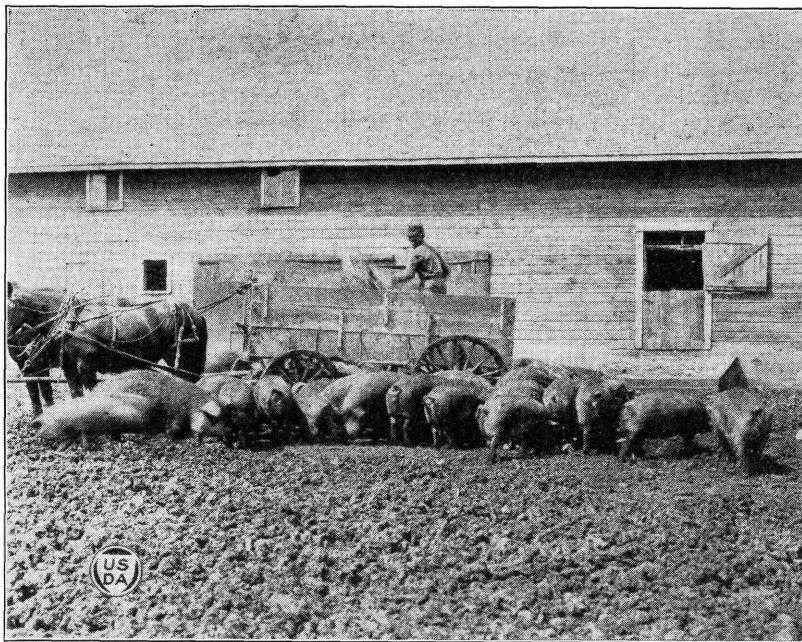
A supply of clean drinking water should be available at all times. Some type of automatic drinking fountain which does not overflow is advisable (fig. 3).

<sup>2</sup> For information concerning hog houses reader is referred to Farmers' Bulletin 1490 Hog-Lot Equipment, issued by the U. S. Department of Agriculture.

<sup>3</sup> Farmers' Bulletin 1437, Swine Production.

Parasites, even those that may not by themselves cause death, tend to lower the resistance of their hosts to such an extent that invasion by disease agents is made easy and losses from disease result. Therefore, the control of internal parasites is an important part of any disease-prevention program.

If pigs are pot-bellied, rough-coated, and generally unthrifty but have no fever, whether or not they have thumpy coughs, they are parasitized, and something is radically wrong with the sanitary procedures on the farm. If swine production is to be carried on profitably



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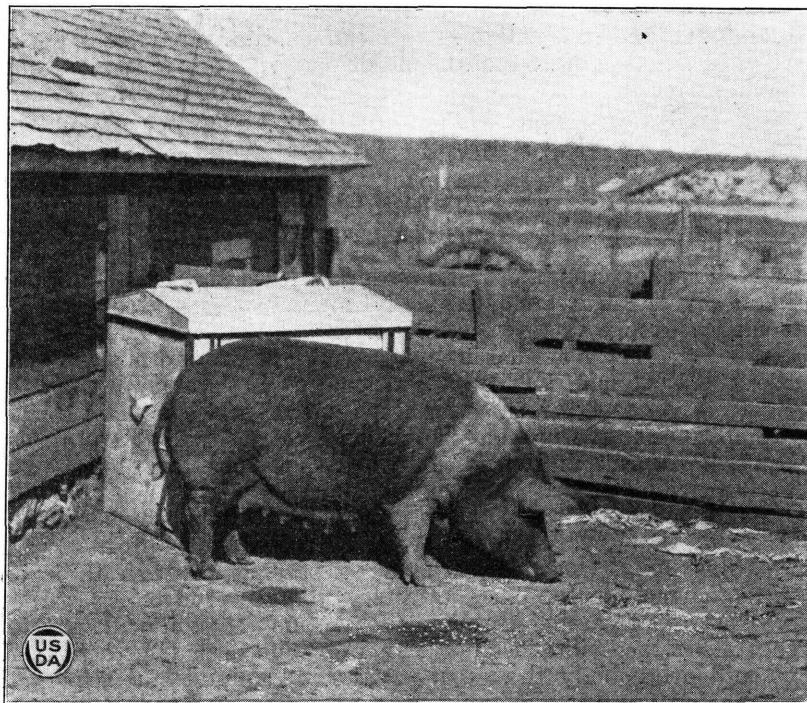
FIGURE 1.—An improper method of feeding hogs. Using clean troughs, platforms, or self-feeders is more sanitary and conducive to health than throwing feed on the ground.

a program of treatment and prevention must be instituted and maintained.

Parasites have tissues similar in many ways to the tissues of the host animals in which they live. Naturally, drugs toxic enough to harm the parasites, if not properly administered, may cause considerable damage to the host. Therefore, it is necessary that diagnosis and treatment for parasites be left to a veterinarian who will ascertain which type or types of parasites are involved and will select and administer his drugs accordingly, graduating the dosages so that they will be suitable for the age, weight, and condition of the animals receiving them.

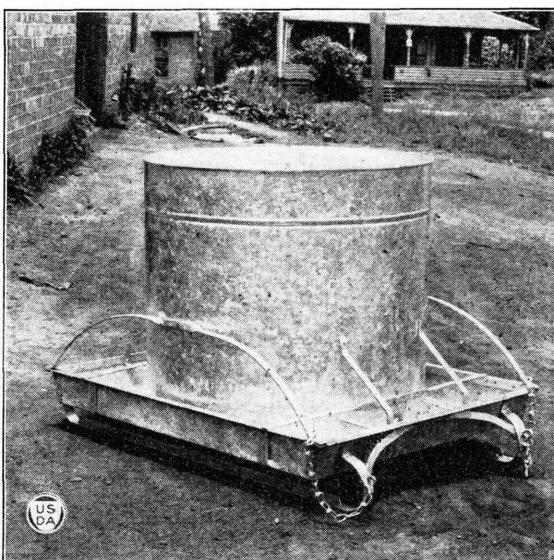
Prevention plays a major part in the control not only of parasites but also of the diseases discussed in the following pages of this bulletin. A swine sanitation system<sup>4</sup> which is highly effective in disease and

<sup>4</sup> For information on swine parasites and methods of control see Farmers' Bulletin 1787, Internal Parasites of Swine.



13015-C

FIGURE 2.—Sanitation in feeding is an aid to health and thrift. Here the feed is given on a clean concrete floor.



4081-C

FIGURE 3.—Sanitary drinking fountain.

parasite control, consists in putting clean sows in clean farrowing pens, moving the sow and pigs to clean pasture, and keeping them there until the pigs are 4 months old or older. To prevent losses due to navel infection, treat the navel of each pig with tincture of iodine as soon after birth as possible. This may also serve to eliminate many cases of enlarged joints.

## INFECTIOUS DISEASES

### HOG CHOLERA <sup>5</sup>

Hog cholera is the most serious swine disease. From statistics gathered by the Bureau of Animal Industry it has been estimated that the losses in a single year have been as high as \$65,000,000, and the probable average annual loss for any 10-year period has amounted to about \$20,000,000. These losses occur even though the biological products developed for the immunization of swine against cholera are a highly effective preventive when properly used. The injection of serum or of serum and virus is only part of the problem of preventing losses from this disease.

**CAUSE.**—Hog cholera is caused by a filtrable virus which is so small as to be invisible to the eye even when aided by a powerful microscope. The virus is capable of passing through the pores of filters which hold back ordinary disease-producing germs. The virus, after passing through such filters, upon inoculation into susceptible swine, will cause hog cholera. The virus is present in the blood and other body tissues of an affected animal and also in the urine and feces and in the secretions of the eyes and nose. The only way to find out whether the virus is present in these substances is to inject them into cholera-susceptible and cholera-immune pigs. Usually bacteria-free filtrates of the blood are used. In a disease such as encephalomyelitis in horses (sleeping sickness), mice and guinea pigs can be used to detect the presence of the causative virus, but swine are the only animals susceptible to the virus of hog cholera.

**PERIOD OF INCUBATION AND SYMPTOMS.**—The period of incubation is the period of time elapsing between the entrance of the virus into the body and the appearance of the first symptoms of the disease. This period may be 3 to 7 days, but most cases show symptoms on the fourth day after exposure.

There are many ways by which hog cholera may be introduced into a herd. Commonly only one or two pigs will sicken, and several days may pass before more animals become sick. When the disease is introduced by means of a scrap of raw pork which contains hog cholera virus, the pig eating it will be infected. At least a couple of days will pass before the urine from this pig will contain virus. Other pigs eating feed contaminated with this urine will become infected. However, the period of incubation must elapse before these pigs show symptoms. Thus when cholera is introduced in a herd only one pig may be sick, and others will not show symptoms until several days later. This characteristic of the disease shows the importance of being concerned even though only one pig in a herd becomes sick. Any sick pig should be separated from the healthy pigs immediately. This measure, together with early diag-

<sup>5</sup> More detailed information concerning this disease may be obtained from Farmers' Bulletin 834, Hog Cholera: Prevention and Treatment.

nosis, if the trouble is due to cholera, will go far toward limiting the losses in the herd, providing the healthy animals are in a condition to be and are properly immunized. Consulting a veterinarian and obtaining his services and possibly sacrificing the first pig to sicken for a post mortem examination may be far more economical than waiting until symptoms appear in other pigs as a result of exposure to the first one. Once an animal has shown visible symptoms, the possibility of recovery is very doubtful regardless of any treatment. At this period the only treatment that may be beneficial consists in giving large doses of anti-hog-cholera serum.

**SYMPTOMS.**—Usually in uncomplicated cases the first symptom observed is a partial or complete loss of appetite. At this time there is fever, the temperature usually being 105° to 106° F. There



FIGURE 4.—Hogs in advanced stage of hog cholera.

may be constipation, which is followed in a few days by diarrhea. Symptoms of coughing may be noticed, and the eyes may be inflamed and filled with a whitish discharge, causing them to be gummed together. Later brownish crusts may cover the edges of the eyelids. As the disease progresses, the pig shows weakness, depression, and staggering gait and becomes gaunt and tucked up in the flank. Reddish or purplish discoloration of the skin of the ears, belly, and legs is frequently observed (fig. 4).

**LESIONS.**—On post mortem examination some or all of the following lesions may be noted: Hemorrhages (small, dark-red spots) showing through the covering of the kidneys, and bright-red blotches on the surface of the lungs and the outer covering of the intestines. In advanced stages, pneumonia is generally observed. The lymph glands are congested and enlarged, those most easily observed being located at the angle of the lower jaw, in the flanks, and in the fat of

the intestines. Small red blotches may be found on the inner lining of the bladder and on the heart. In the advanced or chronic stage, large buttonlike ulcers may be seen on the mucous membrane (inner lining) of the large intestines near the point where the large and small intestines join.

In uncomplicated cholera, characteristic lesions are common. However, secondary diseases such as suipestifer infection (*Salmonella choleraesuis*) and swine plague are frequently associated with cholera. In such cases the lesions of the secondary diseases may obscure the cholera lesions. Most of the pneumonia in swine accompanies hog cholera.

**PREVENTION AND TREATMENT.**—There is no dependable treatment for a hog visibly sick with hog cholera. Owing to the sudden onset and the rapid spread of the disease, herds should be constantly protected against the danger of infection. By protection is meant the regular immunization of all pigs, usually at weaning time, by practicing veterinarians using hog-cholera serum and virus, or vaccine prepared specifically for this purpose. Cleanliness in the hog lot, the pen, and the shelter is conducive to the welfare of the herd. Proper housing, disinfection of quarters from time to time, keeping the animals within well-fenced lots to protect against infection carriers, and care in feeding will aid in keeping the herd free of disease.

If a neighboring farm has a hog cholera outbreak, one should stay away from the premises. Any person coming from that farm to a normal herd may carry infective material on his feet. Cleanliness and good sanitary methods alone, however, are not complete safeguards against hog cholera. It may be introduced by feeding garbage or kitchen or table scraps if such feed contains bits of pork trimmings, rinds, or bone. Great care should be used to avoid feeding such offal to cholera-susceptible swine. Before garbage feeding is undertaken all hogs should be properly immunized with serum and virus. In case a herd is attacked by hog cholera, prompt attention is essential to prevent heavy losses. Treatment for immunization should be administered as soon as the disease is recognized or preferably when there is reason to suspect that the animals have been exposed to the infection. If any of the hogs have died, the carcasses should be burned or deeply buried. After the sick ones have recovered or been destroyed and no further spread of the disease is noted, all quarters to which the animals have had access should be cleaned and disinfected.

Anti-hog-cholera serum is primarily an immunizing agent to be used with hog-cholera virus to prevent the occurrence of hog cholera. However, when used in the early stages it seems, in some cases, to have a curative effect. If hog cholera is suspected, it is always best to call a veterinarian.

#### Diseases and Conditions Resembling Hog Cholera

Other diseases that may be confused with hog cholera or that go unnoticed during hog cholera outbreaks, include anthrax, epilepsy, gastro-enteritis, necrobacillosis, pleurisy, pneumonia, poisoning, swine plague (hemorrhagic septicemia), swine erysipelas, swine influenza, tuberculosis, and worm infestation. Any deviation from the normal in the functions of an animal, such as gait, appetite, or digestion,

deserves the closest watching in order that measures may be taken to prevent serious results and possible losses. Although some minor ailments of swine may be treated successfully by the owners, it is always well, in case of doubt, to call for more experienced service.

#### SWINE ERYSIPelas (DIAMOND-SKIN DISEASE)

Swine erysipelas, a disease primarily of sows but occurring at times in hogs of all ages, is rapidly becoming one of the more important diseases of swine, particularly in the Midwestern States, where the disease occurs in an acute and sometimes rapidly fatal form. The disease frequently assumes a chronic form involving the joints and occasionally is observed as the so-called "diamond-skin disease."

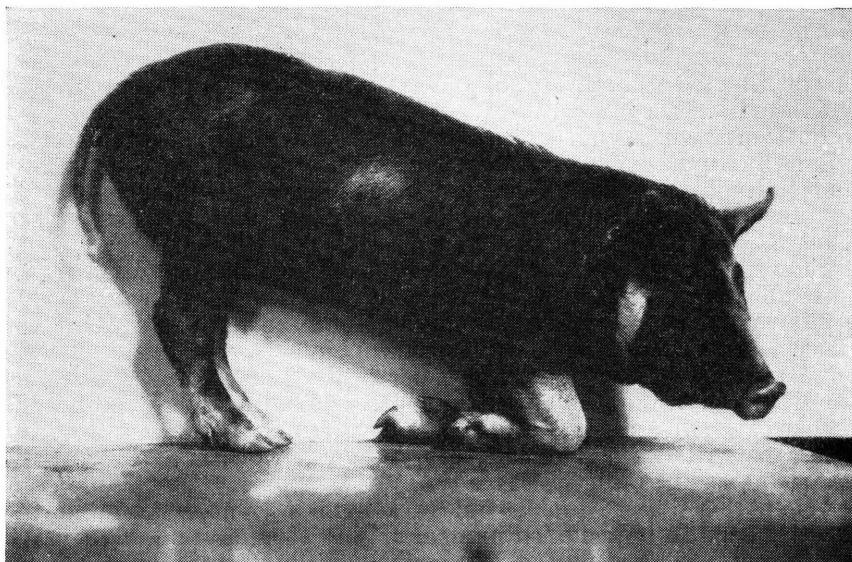


FIGURE 5.—A pig affected with the acute form of swine erysipelas. Soreness of the joints, which is more pronounced in the front legs, causes the pig to kneel in order to relieve the pain.

**CAUSE.**—Swine erysipelas is an infectious disease caused by a specific micro-organism, *Erysipelothrix rhusiopathiae*. This organism is eliminated from the bodies of infected hogs and from so-called "healthy carriers," by way of the feces and urine. Hogs pick up the infection by eating feed, drinking water, or rooting in soil contaminated with this organism. The disease may occur at any season of the year but is generally encountered during the spring, late summer, or fall months.

**SYMPTOMS AND LESIONS.**—Swine erysipelas is a disease which, without the aid of trained men and laboratory facilities, often may be extremely hard to differentiate from hog cholera. In the acute stage of the disease, (fig. 5) there may be one or more sudden deaths. High temperature, loss of appetite, stiffness of gait, and arched back may be noted. Sick hogs withdraw from the herd and lie in their beds but upon being disturbed start off with considerable activity.

Those hogs surviving the acute stage may go on to complete recovery, or they may be afflicted with chronic arthritis, characterized by enlargement and stiffness of the joints. This, the arthritic form, is the type of swine erysipelas most frequently seen in hogs in this country, giving rise to the often-repeated statement that the hogs have rheumatism. The temperatures of such animals return to normal but owing to pain on moving the affected joints, or to weakness, or to the condition of the heart valves, such animals may spend much of their time lying on their breastbones or sitting upright. At this stage many secondary changes may occur such as gangrenous involvement and sloughing of the skin of the ears, snout, back, sides, and tail. Enlargements of the joints and stiffness, indications of the arthritic form of the disease, may occur in hogs that at no time were affected with the acute form of the disease.

The urticarial form of swine erysipelas may be recognized by the so-called diamond-shaped dark-red or purplish areas of irregular size on the infected animals (fig. 6). These areas turn white when pressed with the hands.

Post mortem examination may show congestion of the internal organs and more or less inflammation of the stomach, small intestines, and the urinary bladder. However, the lesions in this disease are not always constant and may be quite similar to those seen in hog cholera.

**PREVENTION AND TREATMENT.**—No medicine has yet been found to be of any value for the treatment of this disease, but anti-swine-erysipelas serum properly administered in the early stages of the disease has considerable curative value. Since even trained observers have difficulty in distinguishing swine erysipelas from other septicemic conditions in swine, the swine producer, instead of trying indiscriminate treatments, should call a trained veterinarian to make positive diagnosis with the aid of laboratory examinations and to prescribe proper procedures in each case.

When this disease breaks out in a herd it is necessary that the healthy animals be removed immediately to clean ground and treated with serum. The visibly affected animals, if not too far gone, should be given serum and removed to a pen away from the healthy hogs. Those with the chronic form of the disease should be removed from the herd and destroyed as they rarely pay their way and serve only to maintain a source of further infection in the herd. Dead animals should be buried deeply after being covered first with lime, so that dogs and rodents may not reach the carcasses and thus spread the infection. Infected houses, pens, feeding troughs, and other equipment should be thoroughly scraped, scrubbed, and disinfected. A hot 2-percent lye solution is efficient as a disinfecting agent.

Here, as in hog cholera, it is important to remember that pork scraps may be a source of danger when fed to swine.

Soil infection plays an important part in the spread of this disease. Following an outbreak of swine erysipelas in a herd and the removal of the healthy animals to clean ground, a system of crop rotation should be begun on the old infected ground. The most effective means of cleaning a hog lot following any disease is to remove all litter and spread it on fields where the hogs will not come in contact with it, plow up the lot, and sow wheat, rape, rye, or other forage crops. Exposure to sunlight and drying, provided hogs are not present to keep

the organism alive by passing it through their bodies, may in time bring about the destruction of the organism.



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FIGURE 6.—A section of skin from a pig affected with the urticarial form of swine erysipelas. Note the diamond-shaped areas remaining on the skin after the hair has been removed.

#### TUBERCULOSIS

Farmers' Bulletin 781, Tuberculosis of Hogs, contains detailed information on this disease. It may be obtained from the Depart-

ment of Agriculture on request. A few phases of the disease are discussed in the following paragraphs.

Tuberculosis in livestock in general is caused by one of three types of tuberculosis germs; namely, the bovine (cattle), the avian (poultry), or the human. Prior to, and during, the early period of the campaign for the eradication of tuberculosis in cattle, a large percentage of tuberculosis in swine was due to the bovine type and resulted from feeding on the feces or milk of tuberculous cattle.

As the eradication progressed, observations revealed that many tuberculous swine were still coming from modified accredited areas which were relatively free from tuberculous cattle. Further investigations disclosed that the poultry on the farms from which the infected swine originated had tuberculosis. Tests showed that the germ causing the disease in these pigs was of the avian type. It is now known that most of the tuberculosis in swine is due to the avian type.

The proportion of tuberculosis in swine due to the human type of germ is relatively slight, as the opportunity of exposure to this germ is comparatively uncommon.

**SYMPTOMS AND DIAGNOSIS.**—The vast majority of swine affected with tuberculosis never show any symptoms of the infection. However, such animals would give a positive reaction to the tuberculin test. In advanced stages, symptoms of digestive disturbance and cough may be shown. Occasionally lesions in the bones or joints may cause lameness and other visible indications. Without the aid of the tuberculin test, diagnosis is generally made by post mortem examination and finding the tuberculous lesions. The trained inspector knows the common location and appearances of these lesions. Tuberculosis in swine is usually detected in packing plants by veterinary inspectors. However, since tuberculous poultry are a source of infection in swine, a swine producer should, at least, take the precaution of finding out whether any poultry which may come in contact with the swine are tuberculous. If they are not, he has reasonable assurance that the swine are free from tuberculosis, provided the eradication of tuberculosis in any herd of cattle with which they might come in contact has been maintained. If the poultry are tuberculous, efforts should be directed toward the eradication of the disease in both the swine and poultry.

**PREVENTION.**—Detailed information on the eradication and prevention of this disease from poultry and swine is given in United States Department of Agriculture Leaflet 102, Eradicating Tuberculosis from Poultry and Swine, and Farmers' Bulletin 1652, Diseases and Parasites of Poultry.

#### **SUIPESTIFER INFECTION (PARATYPHOID, NECROTIC ENTERITIS, SWINE TYPHOID, "NECRO")**

Suapestifer infection occurs quite generally but may be more prevalent in some sections than in others. As its name indicates, this condition is the result of infection with a micro-organism, *Salmonella choleraesuis* (*suapestifer*), which is a member of the paratyphoid group. This organism is a peculiar one in that it may be present in many hogs without causing any appreciable damage; that is to say, the animals are carriers of the organism. However, this organism may become active when a change takes place in the carrier animal. This may be a feeding disturbance, the result of infection with viruses such as those

of hog cholera or swine influenza, or any other change that may take place in the animal's environment. Once the organism becomes active in the carrier animal, it may spread readily to other animals and produce a definite disease condition.

As stated before, this organism quite frequently becomes highly active in the presence of hog-cholera infection. This may be brought about by the virus of hog cholera gaining entrance to an animal which is harboring the *Salmonella* organism without appreciable damage up to the time the animal becomes infected with hog-cholera virus. The changes that take place in the animal as a result of hog cholera infection give the paratyphoid organism an opportunity to exert its virulence and invade the body tissues, producing definite lesions. The organism is then present in the various tissues of the body and may pass from such an animal to otherwise normal animals together with the hog-cholera-virus infection and produce a very severe condition terminating in the death of the infected animal. The *Salmonella choleraesuis* organism has been considered to play a part in so-called hog-cholera "breaks," and the greatest precaution should be taken in the immunization of pigs with hog-cholera virus and anti-hog-cholera serum where it is known that this organism may be present in the herd. This discussion deals particularly with the disease produced by the *Salmonella choleraesuis* organism itself and not with the role that it might play as a secondary invader in connection with other infectious diseases such as hog cholera and swine influenza. Two forms of the disease are generally recognized, the acute and the chronic.

#### The Acute Form

The acute form of the disease is also known as paratyphoid, pig typhus, swine typhoid, or suipestifer infection. It may affect swine of any age, but young pigs and shotes appear to have less resistance to the infection than older swine. The occurrence of the acute form as a primary infection appears to be very limited in the United States. The affected pigs exhibit a rise in temperature, refuse to eat, and are disinclined to move even when forced. They may have diarrhea or be constipated. Within 2 to 4 days, or even less, such animals often die. A red color, changing to purple, may be noted on the skin of the ears, abdomen, inner sides of the thighs, and sometimes on other parts of the body.

**POST MORTEM APPEARANCE.**—Upon autopsy, the following changes may be noted: Purplish discoloration of the tonsils and surrounding tissues. Necrotic lesions in the tonsils may also occur. The epiglottis is frequently congested and has a reddish, muddy appearance. The submaxillary, cervical, and bronchial lymph glands are congested, and usually have a very deep red color. Other lymph glands of the body often have a similar appearance. The spleen and liver frequently are enlarged due to congestion. The kidneys are darker in color than normal, and in some instances have a characteristic dark mahogany color. Sometimes the kidneys show hemorrhages like those seen in hog cholera. The bladder shows varying degrees of inflammation. There is frequently marked inflammation of the stomach, which is often confined to the fundus portion. The small and large intestines are inflamed sometimes to the extent that there may be an escape of blood from the vessels of the intestinal wall, causing the intestinal contents to be bloody.

**DIFFERENTIAL DIAGNOSIS.**—This type of infection is not readily distinguished from some of the more common septicemic diseases of swine. Frequently the aid of laboratory examinations is necessary to make a definite diagnosis. Herd history, field examination to eliminate other infections, and post mortem study of sick and dead pigs are helpful in arriving at a clinical diagnosis. As stated above, this infection is seen frequently as one secondary to hog cholera. For this reason a disease outbreak in swine should be diagnosed as an acute primary paratyphoid infection only after the possibility of the presence of hog cholera has been definitely eliminated.

#### The Chronic Form

##### (Necrotic Enteritis, "Necro," Paratyphoid)

Recently attention has been given to the relationship of nutrition to the development of the chronic form of the disease. The results of investigations now in progress in different sections of the country may clarify the question of this relationship. This type of suipestifer infection generally begins with a rise in temperature, diminished appetite and diarrhea. After a few days the temperature may return to normal and the appetite improve, but the animals remain unthrifty and fail to gain in weight. Then emaciation, weakness, prostration, and death often follow, particularly when no efforts are made to control the disease.

The post mortem lesions of the internal organs are confined chiefly to the gastrointestinal canal. Varying degrees of necrosis are found in the tonsils in many cases. The intensity of the involvement of the stomach may vary greatly. In some cases the lining of the stomach is normal. In others the alterations vary from slight or marked inflammation to extensive necrosis. The small intestines may also show inflammation and necrosis, but it is the linings of the cecum and colon that generally show the most advanced lesions, where the walls may be several times thicker than normal owing to the gray cheesy deposits of dead tissue.

It has been observed that a number of factors may lower the resistance of swine, particularly young pigs and shotes, in such a manner that they may be more severely affected by the disease. Exposure to inclement weather, the fatiguing effects of transportation, feeds lacking in essential minerals, vitamins and protein, and reactions due to swine-erysipelas and hog-cholera vaccination have long been recognized as debilitating factors. Numerous investigations of the relationship of nutrition to the development of this disease have been reported. Until further information on the exact relation of nutrition to the disease is available, the following points should be kept in mind:

Necrotic enteritis is a chronic form of suipestifer infection.

A vitamin deficiency, presumably nicotinic acid in particular, will produce a disease in swine, some aspects of which may simulate necrotic enteritis.

When similarly exposed, pigs affected with this vitamin deficiency may be subject to a severer form of necrotic enteritis than pigs not so affected.

When the rations are deficient, such supplements as nicotinic acid and possibly other factors of the vitamin B complex are advised for the prevention and treatment of the deficiency disease.

No known medicinal preparation possesses sufficient merit to be recommended as a specific treatment for necrotic enteritis. Various remedies have been used but frequently with little success.

Rigid enforcement of swine sanitation<sup>6</sup> has often been effective in the prevention and control of necrotic enteritis. After the disease has become established in a herd, favorable results in its control have been obtained by separating the apparently healthy pigs from the sick and placing them in clean quarters or on ground not previously used for swine. This group should be observed closely, and if any show symptoms of illness they should be removed immediately.

### SWINE DYSENTERY

Swine dysentery is also known as infectious hemorrhagic enteritis, swine typhus, bloody diarrhea, bloody scours, bloody dysentery, bloody flux, black scours, and colitis (inflammation of the colon).

The disease has been reported in many sections of the country, but it appears to be most common in the swine-producing States of the Midwest. The history of the majority of outbreaks shows that the affected animals in most instances have been either directly or indirectly in contact with sales barns or public stockyards.

**SYMPTOMS.**—Swine dysentery is considered to be an acute infectious disease, and its outstanding symptom is usually a profuse bloody diarrhea. Sometimes the feces are black instead of bloody and contain shreds of tissue. Some of the affected animals go off feed; others show no loss of appetite. They may have fever but the temperature is usually less than in hog cholera and swinepestifer infection. Some may die suddenly after a couple of days of illness, whereas others linger for 2 weeks or even longer.

**CAUSE AND LESIONS.**—The cause of swine dysentery has not yet been determined. The disease develops in healthy pigs when they are fed the contents of intestines from affected ones.

The lesions (tissue changes) found in pigs that have died after a short illness are mostly in the large intestine. The lining is inflamed and bloody. In later stages shreds and patches of dead tissue are found attached to the walls of the intestine or loose in the bowel. Lesions may be found in other parts of the body when complications set in.

**CONTROL.**—Many remedies have been used to treat and control swine dysentery. Favorable results have been reported following the use of some of them, but as yet none have had enough merit to be recommended as a specific treatment.

The best results in controlling the disease have been obtained by relying on sanitation as a means of prevention, since no means of vaccination or immunization is known. As affected pigs and possibly those that have recently recovered are the common sources of infection, great care should be used when swine from the outside are brought to a farm where there is a herd of healthy pigs. The new group should be isolated and quarantined where they may be observed for at least a week, preferably longer, before being added to the healthy herd.

If swine dysentery has become established in a herd, the apparently healthy pigs should be separated from the sick ones, and both groups

<sup>6</sup> The swine-sanitation system is outlined in the section on Prevention of Diseases; at the beginning of this bulletin.

moved to clean quarters. The healthy group should be observed closely, and if any of them sicken they should be removed immediately. In this way the number of pigs that become sick may be held to a minimum.

### ANTHRAX

Anthrax is an infectious disease which usually attacks cattle, horses, and sheep. Hogs are less susceptible to the disease but may contract it in an acute form as a result of eating the carcass of an animal dead of anthrax. It is more commonly seen in the hog, however, in a subacute form in which the throat becomes markedly swollen. This less acute form of the disease is acquired by pasturing on infected soil or drinking from drainage pools or other contaminated water supplies. It not infrequently follows partial recovery from an acute attack.

**CAUSE.**—Anthrax is caused by a specific micro-organism known as *Bacillus anthracis*. On leaving the infected animal, this organism forms spores which are exceedingly resistant to destruction and may survive in the soil for years. The contamination of the soil with infectious material may be brought about in several ways. Surface water may bring the spores of anthrax from infected places and deposit them; dust containing spores may be carried by the wind; but the usual manner by which the soil is infected is from evacuations of infected animals and from the carcasses of animals which have died of anthrax.

**SYMPTOMS.**—The most common form of anthrax in hogs is that in which the lesions are principally confined to the region of the throat. In some cases there may be marked swelling of the throat, causing considerable difficulty in swallowing and breathing. In cases where there is no swelling the symptoms observed are only debility, suppressed appetite, and hiding under bedding.

In the acute form the symptoms of anthrax appear suddenly, and quite often the animals are found dead before anything wrong has been observed. When the disease is noted in the living animal there is a high temperature, a complete loss of appetite, chills, and muscular tremblings. The breathing is labored, the throat becomes swollen, mucous membranes are blue, and retching and vomiting may become so severe that the animal chokes to death.

**POST MORTEM CHANGES.**—In hogs the outstanding anatomical changes are confined principally to the region of the throat, where there is a marked gelatinous and hemorrhagic condition of the connective tissues and lymphatic glands. The tonsils are enlarged and frequently covered with a dark, discolored false membrane. Swelling of the structures forming the glottis is also observed. Although the spleen is frequently normal in size and color, enlarged, dark, and soft spleens may be found in cases where the disease has become generalized.

Local lesions of long standing are sometimes found in the throat region of slaughtered hogs that showed no visible signs of anthrax during their life and which were apparently healthy prior to slaughter. In these cases the disease is confined to the pharynx and the adjacent tissues, including the lymph glands of that region. Localization of anthrax in the mesenteric glands has also been observed. In this chronic localized type of anthrax the lymph glands of the head, especially the submaxillary glands, may be either slightly or greatly

enlarged, hard, and fibrous. The cut surface presents a mottled appearance, being produced by areas which are brick red in color, patches or streaks having a dull gray, parboiled appearance and necrotic foci which may be dry and cheesy. One or both tonsils may show areas of degeneration and necrosis ranging in size from that of a pinhead to that of a silver dollar. The epiglottis may be greatly swollen.

When anthrax is suspected in a herd DO NOT OPEN any of the suspected carcasses in order to make a diagnosis. This should be done only by an experienced veterinarian, who is able to protect himself, and the premises should the animal's death be due to anthrax.

**PREVENTION.**—Vaccines are used extensively for protecting cattle, horses, and sheep against anthrax, but vaccination of swine is seldom practiced. A serum is available also for treatment of animals already affected with the disease. No other product, drug, or combination of drugs can be depended on to cure an established case of anthrax. Outbreaks of the disease should be reported promptly to the proper State authorities, who can advise on methods for control of the disease.

Do not under any circumstances feed swine cooked or uncooked meat from animals that have died. This is of particular importance in anthrax districts. Once anthrax is established in an area it is exceedingly hard and costly to combat.

During an outbreak of anthrax in a herd, dispose of all carcasses by complete burning. DO NOT OPEN the carcasses or allow secretions to drip from natural openings. Close them with cotton or tow soaked in disinfectant before removing the carcasses for burning. This disease is transmissible to man, and great care must be observed in the handling of anthrax cases so as not to get infectious material into cuts or scratches in the skin.<sup>7</sup> Such infection may have fatal results.

Soak with disinfectant the ground and all equipment with which anthrax-infected swine have been in contact. Follow this by scraping, removing all material, and burning it or mixing it with quicklime. Keep such material from coming in contact with other swine. Then clean the premises thoroughly, following with a coating of disinfectant. All litter, bedding, and manure in the lot used by the sick hogs should be burned, as such material is likely to spread the disease.

#### SWINE PLAGUE (HEMORRHAGIC SEPTICEMIA)

Swine plague or hemorrhagic septicemia may be classed more as a secondary or complicating condition rather than a primary disease. Transmission from animal to animal, although possible, appears to occur rarely. This infection may occur as a septicemia or in a pulmonary form, which is essentially a type of swine pneumonia. This latter type is the form most frequently observed in this country.

**CAUSE.**—Swine plague is caused by a specific organism, *Pasteurella suisepitica*, which is often found in the respiratory tracts of apparently normal hogs. It may exist without doing harm to its host until the vitality of the hog is lowered through disease or other factors, such as shipping, weaning, improper feeding and housing, or as a result of lung irritation caused by excess dust. In such cases the germ attacks the

<sup>7</sup> For further information see Farmers' Bulletins 1736, Anthrax, and 954, The Disinfection of Stables, issued by the U. S. Department of Agriculture.

weakened tissues, and swine plague results. This accounts, perhaps, for the fact that swine plague is often found as a complication in connection with hog cholera, necrotic enteritis, or in hogs infested with internal parasites. When hog cholera and swine plague are present in the same animal at the same time, it is practically impossible, even with a post mortem examination, to establish a line of demarcation between them.

**SYMPTOMS.**—These are not characteristic and will vary in accordance with the disease or factor to which swine plague is secondary.

**PREVENTION.**—Handle outbreaks of suspected swine plague as hog cholera until the latter disease has been eliminated as the possible cause of the trouble. Since the germ causing swine plague may be present in healthy swine and become active when their vitality is lowered, prevention is a matter of maintaining their health and vigor by providing proper feeding and sanitation. Avoid exposure by providing comfortable sleeping quarters. Sera and bacterins are frequently used for the immunization of healthy swine previous to shipment where they may be subjected to unavoidable exposure.

#### SWINE INFLUENZA (HOG "FLU")

Swine influenza or hog "flu," sometimes referred to as infectious bronchitis, is an infectious disease of swine which appears widespread, particularly in sections where hogs are raised in large numbers. It is a herd disease, attacking a large percentage of the animals at the same time.

**CAUSE.**—Swine influenza is caused by the combined action of a filtrable virus and an organism, *Hemophilus influenzae suis*.

**SYMPTOMS.**—Swine influenza is characterized by the sudden prostration of a large portion of the herd. There is complete loss of appetite. Spasmodic breathing, or thumps, is one of the first symptoms noted. When urged to move, the animals may have violent fits of coughing. The eyes may be red, swollen, and weepy. There may be a discharge from the nose, often streaked with blood. Occasionally a hog will vomit stringy mucus tinged with bile. The temperature in typical outbreaks ranges from 104° to 108° F. and usually drops to 103° to 104° in about a week, when, if the hogs survive, they are usually back on feed.

**TREATMENT.**—The treatment for swine influenza is almost entirely hygienic. Place the animals in warm, clean, well-bedded quarters, with plenty of fresh air, and provide plenty of fresh drinking water. Give little feed or none at all for 24 hours. In herds where good sanitary conditions prevail the mortality in swine influenza is very low. It is not uncommon for an entire herd to be affected, and even though the clinical symptoms are quite alarming, all may make complete recovery within a week. When sanitary conditions are poor, and especially in garbage-feeding lots, secondary complications frequently intervene, accompanied with heavy losses.

#### ARTHRITIS (INFLAMMATION OF THE JOINTS)

A group of conditions recognized as lameness with or without swelling or enlargement of the joints and surrounding tissue, or these enlargements without lameness, have been commonly referred to as arthritis. Sometimes they have been called articular rheumatism.

Within recent years the specific causes of some of these forms of arthritis have been definitely determined.

Some forms of arthritis are common, while others occur rarely. A specific form of arthritis which frequently occurs is that caused by the swine erysipelas organism. Bacteriological studies have revealed the presence of this organism in about 75 percent of the examined cases of arthritis observed in the carcasses of swine slaughtered in packing plants having Federal inspection.

Another condition in this group, although there may be no actual inflammation of the joints, is caused specifically by nutritional deficiencies in the rations (see rickets and posterior paralysis).

A third condition in this group is commonly known as navel ill or joint ill. It includes infections with various disease germs, and the infection may be generalized throughout the body or may be localized in certain organs or areas. It commonly begins as a local infection of the navel cord and often spreads from there to other parts, particularly the joints and the areas which surround them. Immediately after birth and before it dries, the stump of the navel cord of baby pigs furnishes a favorable place for the growth of germs from the filth with which it becomes contaminated. When the infection occurs by way of the mouth, the infection may reach the joints but not the navel cord. Sometimes the pigs may become infected from the mother before they are born.

**CAUSE.**—Many different germs cause the infections, but the same ones are not present in all outbreaks. Then, too, while this infection is caused by these pathogenic germs, its development may be dependent upon factors that lower the pig's resistance to disease. In recommending control measures, more importance has been given recently to such factors as selection of brood sows, care and feeding of the pregnant sow, provision of proper sanitation, housing quarters and pasture, and diet of young growing pigs.

**SYMPTOMS.**—Generally the first sign is depression, and the pigs are not actively inclined to suckle or may refuse to do so entirely. They have a fever and bowel disorders. When the navel cord is affected, there is a discharge of pus or urine or abscess formation. Affected joints are hot, painful, and swollen, and result in stiffness and lameness. Weakness and emaciation follow, and a large number of the animals die. Some may recover completely, while others apparently recover but remain unthrifty. Even in some of the apparently recovered cases, lameness and arthritis recur when they are penned up for fattening.

**TREATMENT.**—Treatment at best is far from satisfactory. If examination after birth reveals pigs with infection of the navel cord, they should be separated from the healthy ones as an attempt to prevent the spread of the infection. Other measures, so far as they are practical, may include removal to clean quarters preferably with access to pasture, washing the sow's udder, disinfection of contaminated pens, opening abscesses and disinfecting them with tincture of iodine or a 5-percent solution of carbolic acid, and applying hot or other stimulating applications to affected joints.

**PREVENTION.**—While the treatment of this form of arthritis has been unsatisfactory, good results have been obtained for its prevention by carrying out measures for this purpose. (See Prevention of Diseases.)

When arthritis appears in a herd, a veterinarian should be con-

sulted in order that its form may be determined. He is in a position to examine the affected animals and have laboratory tests made if necessary to make a diagnosis. Specific recommendation can then be made in accordance with the findings of these examinations.

### VESICULAR EXANTHEMA

Aside from the damage which may result from vesicular exanthema it is of great importance because of its similarity to foot-and-mouth disease. So far, the disease has been known to occur only in localities along part of the Pacific coast.

The disease is characterized by the formation of vesicles (blisters) on the mucous membranes and skin of the snout and may extend into the nostrils. Vesicles may appear also on the soft tissues just above the hoof and beneath the pads of the feet, causing lameness. The vesicles contain a clear, straw-colored fluid. The temperature is high in the early stages but drops to normal soon after the vesicles rupture and commence healing. The disease is contagious and may spread rapidly to other animals in the herd. Affected animals generally recover, but losses have occurred among suckling pigs, probably on account of their inability to nurse.

Vesicular exanthema attacks swine but not cattle or sheep, whereas foot-and-mouth disease attacks all three species.

Control of vesicular exanthema includes quarantine and other sanitary measures, whereas the control of foot-and-mouth disease involves slaughter of entire herds in which infected animals are found. Foot-and-mouth disease has not occurred in the United States since the outbreak in 1929. However, veterinarians are always on the alert against its possible introduction. Suspected cases should be reported immediately to the proper State official.

### NECROTIC RHINITIS (NECROBACILLOSIS, BULLNOSE, SNIFFLES)

Necrotic rhinitis is a condition affecting growing pigs principally and is characterized by an overgrowth of tissues in the region of the face, nose, and mouth, and by a sloughing of certain of these tissues. Necrotic lesions may occur also on other parts of the body (fig. 7).

**CAUSE.**—This disease results from the invasion of the *Actinomyces necrophorus* into wounds or abrasions on the head or other parts of the body, caused by blows with sharp sticks, fighting, injury to the tissues by the teeth, and laceration of the gums and lips with rough feed or with pieces of bones or wire. Filthy hog lots, access to mudholes, and accumulations of old manure are contributing factors.

**SYMPTOMS.**—Perhaps the first symptom noted is impaired appetite. There is repeated sneezing; hence the term "sniffles." A bloody material is often expelled from the nose in the act of sneezing. Well-defined lumps or swellings occur on some part of the head or face, usually on the snout; hence the term "bullnose." When cut open, these swellings are found to contain a cheeselike pus or substance having a disagreeable odor. The lesions may extend to and destroy the bones of the face, causing the pigs to assume a "dish-faced" appearance. The pigs eat with difficulty, and weakness and emaciation are marked. Death may result.

**TREATMENT.**—In this form of necrobacillosis, or necrosis, treatment should be applied in the early stage in order to be effective. When the

swellings are noted before they are large they should be incised and all the pus removed, if possible. After the swellings have become extensive or sloughing of the tissues has set in, treatment is of little avail, and destruction of the pig is recommended.

#### NECROTIC STOMATITIS (INFECTIOUS SORE MOUTH)

Necrotic stomatitis may be classed as a form of necrobacillosis, and the causes are similar to those of necrotic rhinitis. Affected pigs evidence pain when sucking. On examination of the mouth of a pig,



FIGURE 7.—Necrotic ulcer, a result of necrobacillosis.

a number of inflamed areas or patches may be found on the gums, lips, and hard palate, which later develop into necrotic ulcers. There is a sloughing of the tissues, accompanied with a disagreeable odor. The centers of the sloughed patches are white or yellowish-white in appearance. The pigs are unable to eat, owing to the severe pain, and in a short time become weak and emaciated.

**PREVENTION.**—Treatment is of little avail once either of the above conditions becomes apparent. In the early stages of the disease the removal of animals to clean ground is sometimes effective. Efforts should be made to prevent the occurrence of the disease. Clean up mudholes and other damp, insanitary places, move noninfected pigs to clean ground to check the spread of infection, and slaughter infected animals. If infected animals are moved to clean ground in an

attempt to effect a cure, they should be placed by themselves until a cure is brought about.

#### **BRUCELLOSIS (INFECTIOUS ABORTION)**

Brucellosis of swine is an infectious disease caused by the organism *Brucella suis*, which is one of a group of three organisms responsible for *Brucella* infection in man and domestic animals.

The extent to which the disease occurs in the United States is not well known. The means of determining the presence of the infection in swine are the blood-agglutination test and recovery, from infected animals, of the organism causing the disease such as are used in the diagnosis of brucellosis (Bang's disease) in cattle (see Farmers' Bulletin No. 1871, Brucellosis of Cattle). Limited surveys indicate that the disease occurs and is becoming more prevalent in many localities in the United States and requires control measures to prevent its spread.

There are no symptoms by which the disease can be easily recognized with certainty. Many infected animals may show no symptoms and are merely carriers of the disease. The infection may localize in the reproductive organs of both male and female, bones, joints, and at times in many other parts of the body. Consequently, symptoms may vary accordingly. Some of the most common symptoms are abortion, sterility, and inflammation of the uterus (womb), testicles, and joints. Only a few, if any, of the infected animals in a herd may show these symptoms. These symptoms may occur in other infections and may be due to other causes. Consult a veterinarian for a definite diagnosis.

There is no known medicinal preparation which is effective for the prevention or treatment of this disease. Furthermore, no vaccine has been developed for immunization of swine against brucellosis such as that now being used for brucellosis, or Bang's disease, in cattle.

Methods of prevention and control have been used with success. With the exception of vaccination, they are similar to those used in controlling brucellosis in cattle. The choice of method may be limited by the availability of laboratory tests. Information as to the preferable method under conditions as they occur in a given area may be obtained by consulting local or State veterinarians or State livestock sanitary officials.

As man is susceptible to infection with the organism causing brucellosis in swine, the problem is also one which concerns public health.

#### **SWINE POX (VARIOLA SUILLA)**

Swine pox is an infectious disease characterized by small red spots appearing over a large part of the body. These spots grow rapidly and reach the size of a dime, and in the center of each a hard nodule develops. Within several days small pea-sized vesicles, or blisters, develop, which at first contain a clear fluid; later the contents are puslike. These blisters soon dry up, leaving dark-brown scabs, which later fall off. General disturbances such as fever, chills, and refusal of feed may precede the skin changes previously mentioned, but most of the animals do not appear definitely ill. Aggravated cases may be followed by diarrhea, exhaustion, and death.

In uncomplicated cases, very few pigs die. When an outbreak of

disease occurs in a herd and examination reveals swine pox lesions, it is well to consider the possibility of some other coexisting disease such as hog cholera, especially if some of the animals have died.

**CAUSE.**—Swine pox is caused by two types of viruses. One type is related to that causing pox in various other species of animals, while the other is not. Swine which recover from the disease caused by one type become immune to further attacks by that type of virus but not to attacks by the other. The course of the disease caused by the virus affecting other animals is more rapid and the lesions are more superficial and disappear sooner than those caused by the other type of virus.

The disease is apparently not transmitted from animal to animal by contact. It is transmitted, however, by hog lice and possibly by other insects.

**TREATMENT.**—No treatment for swine pox is known. Good care and general sanitary measures constitute the best means of controlling the disease and preventing complications that might prove fatal. Keeping swine free of lice is a good preventive measure.

#### AUJESZKY'S DISEASE (MAD ITCH)

Aujeszky's disease has been observed or reported to exist in several States. Although in cattle it is a very fatal disease, in swine it usually is relatively mild in character and may go unrecognized. However, it is important to note that although Aujeszky's disease is relatively mild in swine it is readily transmitted from infected swine to cattle, with disastrous results.

**CAUSE.**—This disease is caused by a filtrable virus. In swine the nose may serve both for the entrance and exit of the virus. The disease passes readily from swine to swine and from swine to cattle.

**SYMPTOMS.**—In swine, Aujeszky's disease usually occurs as a comparatively harmless affection with transient illness lasting from 1 to 8 days, slight depression, lack of appetite, moderate fever, and rarely nervous involvement. The death loss generally is slight. A very small percent of cases found simulate the disease as it regularly occurs in cattle. In such cases the swine may refuse to rest, have a frothy saliva, may be unable to drink because of paralysis of the pharynx; there may be spasms of certain muscles, regional paralysis, or general convulsions. The swine may be excited, roll in their bedding, jump to the sides of the pen, and grind their teeth. There may be fever at the beginning of the nervous type of disease, but the temperature soon returns to normal and remains so.

There is at present no known treatment for the disease. It is important to separate affected hogs from cattle. As the disease may often pass unnoticed in hogs, its presence may not be recognized until fatal cases occur in cattle running with the hogs. Cattle apparently do not affect one another with Aujeszky's disease but pick it up from affected swine. Therefore, when the disease appears in cattle, change the system of management, separate the swine from the cattle and keep them separated at all times, thus preventing further occurrence of the disease in the cattle.

### LISTERELLOSIS

Listerellosis is an infectious disease caused by the organism *Listerella monocytogenes*. It has been recognized more in sheep and cattle than in swine. As yet, little is known about the extent of the disease in swine, as a definite diagnosis has been established in a very small number of cases. Symptoms of abnormal gait, trembling, peculiar movement of the front legs, and sometimes fever have been noticed in animals affected with the disease. Since these symptoms also occur in other diseases of swine, only laboratory tests can determine with certainty the presence of this infection.

## GENERAL DISEASES

### ANEMIA OF SUCKLING PIGS

This disease is most often seen in pigs 1 to 8 weeks old, born in the spring or late fall, confined in pens having either cement or tight wooden floors, having no access to soil from which they might obtain a supply of iron and copper, and fed entirely on their mother's milk.

**CAUSE.**—Anemia is brought on because of an insufficient quantity of iron and copper in the diet resulting, in part, from a lack of green feed and an opportunity to root in soil from which the pigs might acquire these necessary elements. The deficiency of these elements in sow's milk is a contributing factor.

**SYMPTOMS.**—At first the pigs appear normal and thrive. However, even during the first week, some of the pigs exhibit a lack of vigor and their coats become rough and staring. They fatigue readily following slight exertion and appear depressed. As the disease progresses, the affected pigs become weak and thin and exhibit a wrinkling of the skin over the neck, shoulder, and legs, and they may develop diarrhea. They quite frequently die from secondary infection. Death may occur, however, at 3 to 4 weeks of age while the animal is still apparently fat and well nourished.

**POST MORTEM APPEARANCE.**—The lesions usually encountered in such cases are a dilation of the heart, which may be pale and flabby, swelling of the throat, excess of fluid in the chest and abdominal cavities, pale and watery blood, enlargement of the liver, and a palleness of muscles and internal organs.

**PREVENTION AND TREATMENT.**—Much may be accomplished in preventing the disease by covering the floor of the pens with several inches of soil or placing a generous quantity of soil in a box to which the young pigs have access, and providing plenty of green feed for the sow and pigs. The soil should be obtained from clean (parasite-free) areas and can be made more effective if fortified with iron and copper salts. To each half bushel of soil should be added 10 grams of ferrous sulfate and 1.5 grams of copper sulfate. These salts should be dissolved in 1 pint of water and sprinkled on the soil, and thoroughly mixed with it. The same measures may be used after symptoms of the disease occur. In lieu of this procedure, the sow's udder may be swabbed once each day with a saturated solution of ferrous sulfate during the nursing period. In some cases beneficial results have followed specific medicinal treatment, which should be administered under the supervision of a veterinarian.

**RICKETS (RACHITIS)**

Rickets is a disease of young animals and is characterized by the failure of growing bone to calcify, or harden, properly.

**CAUSE.**—The disease is caused by a faulty calcium and phosphorus metabolism (assimilation), which results from an inadequate intake or abnormal proportion of these minerals in the diet or as the result of vitamin D deficiency.

**SYMPTOMS.**—As a rule, the first symptoms noted are digestive disturbance, such as loss of appetite, bloating (pot-bellied), weakness, and perverse appetite, the pigs eating filth and gnawing each others' tails and ears. On close observation deformity in the bones of the legs will be seen. Severe pains develop in the muscles, bones, and joints of the legs, and the pigs walk with a stilted lame gait. These symptoms are followed by enlargement of the bones of the legs, especially at the joints, and the long bones become quite bowed. Finally, there is a loss of weight, and the pigs affected become runts.

**PREVENTION.**—The development of rickets may be avoided by proper attention to the feeding and care of pigs after weaning time. It is essential to provide the proper quantities of calcium and phosphorus, the bone-building elements. For growing pigs the ration should contain at least 0.4 percent calcium and 0.3 percent phosphorus, and it is desirable to maintain a ratio of 1 to 2 parts calcium to 1 of phosphorus. Access to direct sunshine is always desirable in order to provide a supply of vitamin D to enable the animal body to make efficient use of the calcium and phosphorus supplied in the ration.

Properly balanced rations, with minerals available, will insure a supply of the bone-building properties after the pigs are no longer nursing.<sup>8</sup> The pigs should have plenty of room for exercise, plenty of sunshine, and pure drinking water, as well as clean, warm sleeping quarters.

**IODINE DEFICIENCY (HAIRLESS PIGS, GOITER)**

In the Northern and Northwestern States considerable losses among spring litters result from "hairless pigs." In certain parts of these States, this condition is more frequent than in others.

**CAUSE.**—This condition is caused by a deficiency of iodine in the feed or water supply of the pregnant sow.

**SYMPTOMS.**—Affected pigs are usually weak at birth and die within a few hours. Some may be born dead. Such pigs are usually hairless, or in some cases there may be thin patches of hair present. In the region of the throat there may be swelling due to enlargement of the thyroid glands. The skin over the neck and shoulder regions is usually thickened and wrinkled.

**TREATMENT AND PREVENTION.**—Iodine deficiency may be effectively prevented by adding 1 to 2 grains of potassium or sodium iodide to the daily ration of the pregnant sow. Another plan calls for the use of iodized salt, either a small quantity in the feed each day or in place of ordinary salt in the mineral mixture mentioned under Prevention of Diseases. Either method should prevent the occurrence of iodine deficiency in swine raised in the so-called "Goiter Belt."

<sup>8</sup> Information on nutritive requirements of swine is given in Farmers' Bulletin 1437, Swine Production, which may be obtained on request.

### POSTERIOR PARALYSIS

The term "posterior paralysis" is used to include conditions characterized by leg weakness, inability to use the hind quarters, staggering or weaving gait, and incoordination. With the knowledge obtained within recent years from the results of experimental feeding tests, it seems reasonable to consider that the vast majority of these difficulties are due to some error in nutrition. These studies show that swine are subject to various deficiencies of minerals and vitamins, and many of these animals so affected show degenerative changes in the spinal cord and certain nerves.

A condition due to insufficient vitamin A, or carotene, in the diet, avitaminosis A, is an example of a specific vitamin deficiency. Detailed studies of this condition have been made. The ration that is frequently used experimentally as one which is deficient in vitamin A consists of white corn, tankage, and minerals. The incoordination or disturbances in locomotion which arise from feeding this ration may vary from a slight posterior weaving gait to complete posterior paralysis so that the hind legs drag when the animal pulls itself along with the forelegs. Sometimes all four extremities are involved. The appetite of affected animals is usually good, but symptoms of night blindness and diarrhea may accompany the muscular incoordination. These symptoms of vitamin A deficiency may be treated successfully with a sufficient addition of substances to the ration to correct the deficiency. Adequate supply may be provided in concentrated forms, but good results are also obtained when it is provided from natural sources often at hand, as green feed, yellow corn, or well-cured alfalfa hay or leaf meal having good green color.

Manifestations of leg weakness may also be seen in sows after farrowing, particularly when the sow is run-down and is being heavily nursed, and in pigs suffering from rickets. Other causes sometimes responsible are (1) injuries such as may be received during handling and shipping, (2) specific lesions in the backbone and other locations affecting the spinal cord and other parts of the nervous system, such as abscesses, tumors, or lesions of an infectious disease like tuberculosis or brucellosis.

**PREVENTION AND TREATMENT.**—The disease may be prevented largely by providing swine with feeds that satisfy their nutritive requirements. Separate publications<sup>9</sup> concerning the feeding of swine are issued by the Department and are available on request.

When sows being heavily nursed are unable to use their hind legs, the pigs should be weaned and the sow supplied with liberal quantities of green feeds and minerals.

Prevention and treatment of those cases of posterior paralysis which occur occasionally from causes other than nutrition will depend upon the specific cause.

### DISEASES OF THE HEAD AND AIR PASSAGES

#### STOMATITIS (SORE MOUTH)

Stomatitis, which is an inflammation of the mucous membrane of the mouth, is rather common in swine.

**CAUSE.**—It may occur as a result of injury by chemicals or other irritants, or from feeding on frozen forage, bearded grains, or foreign

<sup>9</sup> See footnote 8.

bodies, or from injury such as by ropes used in snubbing. It may be seen also during periods of teething and during the course of certain infectious diseases.

**SYMPTOMS.**—The mucous membrane may be swollen and reddened, and there may be an accumulation of exudate on the tongue and in the recesses of the mouth. Profuse salivation and drooling may be noted in the later stages of stomatitis, and the affected animals refuse hard feed. Thirst is increased.

**PREVENTION.**—Stomatitis can be prevented largely through proper care and management of the herd. In garbage-feeding plants a careful check should be made to see that no foreign bodies or irritants are present in the garbage fed to the hogs. Examine affected animals for the presence of foreign bodies in the mouth. Provide plenty of water and feed thin sloppy feeds until the condition is cleared up. Keep in mind the possibility of this condition being a symptom of some infectious disease. If in doubt as to the actual cause, consult a veterinarian.

### PNEUMONIA

Pneumonia in swine is nearly always secondary, that is, it generally accompanies some of the infectious diseases like hog cholera, swine influenza, or swine plague. In the absence of these diseases, exposure to cold and rain, damp filthy pens, or other influences which lower their resistance are predisposing causes of pneumonia in young pigs.

Inhaling gases, dust, or other foreign material will sometimes induce pneumonia, or it may arise from faulty administration of medicine in a drench.

**CONTROL.**—When there is no apparent cause, an infectious disease should be suspected. Consult a veterinarian in regard to diagnosis and treatment. Avoid exposure to predisposing causes. Provide proper housing, sanitation, and feeds.

## DISEASES OF THE DIGESTIVE SYSTEM

### DIARRHEA OF PIGS (SCOURS)

Scours is a very serious ailment of pigs which takes a heavy toll each year from the new litters.

**CAUSE.**—This condition is frequently associated with anemia, and with mineral and vitamin deficiencies. Further, the condition may result either from improper care of both the sows and pigs, or it may be caused by infection in the sow previous to or during pregnancy. The disease may appear in pigs at an age varying from 1 day to several weeks. When it attacks a pig a day or two old, faulty care and feeding of the mother may be the responsible factors. Overfeeding the sow, improper feeding of the sow (as with garbage containing washing powders and other chemicals that may be secreted in the sow's milk), insanitary environment, poor housing, and improper care of the sow, all serve to lower the natural resistance of the young animals and make them susceptible to the disease.

**SYMPTOMS.**—The chief symptom is constipation, followed by a profuse diarrhea. The discharge from the bowels is of a thin, fluid-like character, grayish-yellow in color, and of a very foul odor. At first the appetite is not badly impaired, but in a few days the pigs affected stop eating or nursing and soon begin to lose strength and

flesh. The coat becomes rough and scurfy, and the little pig squeals with pain when handled.

**PREVENTION.**—As the majority of cases are caused by dietary disturbances, the first step in preventing the disease is to see that the sow is getting the right kind and quantity of feed. Do not overfeed the sow during the first 10 days after farrowing. Also do not breed a sow or gilt just recovering or recently recovered from an infectious disease.

If scours sets in when the pig is but a few days old the ailment is nearly always fatal. The nursing sow should be kept in a clean, warm, comfortable pen or shelter where, with her litter, she will have plenty of room, fresh air, and sunshine. Change the bedding daily until scouring ceases. Consult a veterinarian concerning medicinal treatment.

#### DISEASE OF NEWLY BORN PIGS

Among the diseases of young pigs one condition that has been recognized as specific and apparently not associated with pig scours occurs in baby pigs generally from 24 to 72 hours after birth. The pigs appear healthy and normal at birth and are often seen nursing. At the 24-hour period or soon thereafter the pigs seem rather lifeless and weak, wander unsteadily, and may shiver. Often, in this condition, they are too inactive to avoid being crushed by the sow when she lies down, and as a result they may be found with crushed skulls or internal hemorrhages. Or, as the condition progresses the pigs may burrow in the bedding and soon pass into a coma. They usually die within 48 hours after the first symptoms occur. Frequently all the pigs in the litter die, but sometimes only a part of the litter is affected. The condition has been reported to occur in herds where the rations of grains and supplements have been considered adequate and in herds maintained principally on garbage.

Post mortem examination reveals no constant lesion, but one or more changes may be observed. The liver may be yellowish or rather deep red. Perhaps the most common observation is a large amount of curdled milk in the stomach. Some of the pigs may show a slight enteritis. It is unlikely that there will be evidence of diarrhea, but it may appear in those pigs in which the condition is prolonged.

Recent studies of this disease have shown that the sugar in the blood of affected pigs is apparently much lower than in healthy pigs of the same age, but the cause of this decrease in blood sugar (hypoglycemia) has not been determined.

Beneficial results have been reported from treatment of the affected pigs with injections of glucose and force feedings of milk during the early stages of the disease.

#### GASTROENTERITIS (INFLAMMATION OF THE STOMACH AND INTESTINES)

When a number of pigs in a herd are sick and post-mortem examination of one that dies reveals a reddish color of the lining of the stomach and intestines, an infectious disease should be suspected unless some obvious cause is found. A veterinarian should be consulted and, from examinations, should determine what disease is present and what treatment should be given.

Inflammation of the stomach may result from the action of irritating substances, such as lye and washing compounds, drinking brine, or eating too much salt, as well as from many forms of poisoning.

### EVERSION OR PROLAPSE OF THE RECTUM (PILES)

Eversion of the rectum, or prolapse as it is often called, is commonly referred to as piles.

**CAUSE.**—This condition may be caused by a chronic constipation or a diet which is irritating to the lower bowel.

**TREATMENT.**—At first only a small part of the rectum may protrude. If proper treatment is then given, recovery may be effected without complications. However, the condition may become worse so that several inches of the rectum may be exposed. An obstinate constipation may follow, causing an auto-intoxication and the death of the animal.

When the condition is first noticed, the prolapsed part of the rectum should be washed with warm water, anointed with glycerin or olive oil, and replaced by gently pushing it inward with the fingers. The operator's hands should be carefully cleansed before beginning treatment. After the prolapsed portion has been returned to its normal position an enema may be given to flush out the lower bowel and remove any accumulation of feces which may cause further straining. All feed should be withheld for a day or two. After this the animal should be given an easily digested laxative diet consisting mainly of thin slop and bran mash.

If the protruded portion of the rectum is much swollen and infected, it may be impossible to replace it. In this case it is advisable that the part be amputated. This requires the services of a veterinarian, and when the operation is performed properly the results are usually satisfactory if the operation has not been delayed too long.

## DISEASES OF THE REPRODUCTIVE SYSTEM

### MASTITIS (GARGET)

Mastitis, also known as garget, is an inflammation of the mammary glands or udder.

**CAUSE.**—Improper care and feeding of brood sows, particularly just before and after farrowing, contribute greatly to the cause of this condition. The sow's udder hangs close to the ground, is subject to frequent cuts and bruises, and is thus exposed to invasion by infective germs of the litter and soil. Under such conditions, infection finds its way into the tissues through abrasions, sometimes reaching the inner substance of the glands through the openings in the teats. Inflammation, painful swellings, and oftentimes numerous abscesses result.

**SYMPOTMS.**—The symptoms of mastitis are recognized easily. They are a swollen condition of the mammary glands, which are hard and hot to the touch; loss of appetite; and fever. The sow often will refuse to let the pigs suckle because of intense pain. The milk may be stringy or clumpy.

**TREATMENT.**—Many cases of mastitis may be prevented by providing proper care, feeding, and quarters for brood sows. This should include washing the sow's udder with soap and water at the

time she is moved to clean, dry, farrowing quarters which have been previously disinfected and bedded, and reducing the quantity of her feed just before and after farrowing. Detailed information on these measures is given in Farmers' Bulletin 1437, Swine Production. Inflamed udders should be treated with hot applications and massaged twice a day to reduce the swelling. Proper drainage of abscesses should be provided.

#### METRITIS (INFLAMMATION OF THE WOMB)

Metritis is an inflammation of the uterus (womb) and sometimes is better known as pig-bed fever. It arises from infection and may generally be traced to an association with some factor of reproduction such as breeding, pregnancy, abortion, retention of a dead pig or afterbirth, or assistance given during difficult farrowing. Various specific infections may cause the trouble. In many cases the infection may be brucellosis (infectious abortion) and spread to other animals.

Swelling of the external genital organs and a foul-smelling discharge from the vagina usually indicate metritis. Symptoms of chills, depression, restlessness, fever, and loss of appetite may occur also.

When a case of metritis occurs in a herd of swine, a veterinarian should be consulted, not only in regard to providing proper treatment of the affected animal but also in regard to determining the specific infection involved. While proper treatment may save the life of the sick animal, determining the nature of the infection may allow specific recommendations to prevent its spread to other animals in the herd and avoid similar trouble at future farrowing seasons. Proper selection of breeding stock and good care and feeding of brood sows (see Farmers' Bulletin No. 1437, Swine Production) may help to prevent certain cases of metritis.

**TREATMENT.**—Metritis should preferably be treated by a veterinarian. When such services are not available, removal by hand of any pigs or afterbirth and irrigation of the uterus may be helpful. The hands of the operator should be washed with soap and water and coated with olive oil or petrolatum before being inserted in the uterus. Flushing the uterus with mild antiseptics or salt water may be accomplished by means of a small rubber tube attached to a funnel. After the irrigating fluids have been allowed to run into the uterus, they may be siphoned out by lowering the external end of the rubber tube. Fluids frequently used are a 0.5-percent Lugol's solution, prepared by adding a teaspoonful of Lugol's solution to a gallon of water, or a salt solution, prepared by adding a heaping tablespoonful of dry salt to a gallon of water. The water used should first be boiled and then cooled to body temperature. If the solutions are too strong, they may do more harm than good.

The affected animal should be kept isolated until recovery is complete, after which it should be fattened for slaughter at the first opportunity.

### DISEASES OF THE SKIN

#### ERYTHEMA<sup>10</sup>

Erythema is a persistent redness of the skin. Although this condition may result from pressure, rubbing, blows, scalds, burns, freezing, exposure to sunlight, chemical irritants, or irritating secretions of

<sup>10</sup> For information concerning parasitic skin diseases of swine see Farmers' Bulletin 1085, Hog Lice and Hog Mange: Methods of Control and Eradication.

certain beetles, caterpillars, and lice, the important thing to keep in mind is that it may be a condition observed as a rule during the course of specific infectious diseases such as hog cholera and swine erysipelas. It has been associated with faulty elimination, excess of certain feeds, spoiled feed, or abnormal putrefactive processes in the intestine.

Treatment will depend entirely upon the cause. If the disease is caused by too much sun, provide shade; if by feed, change over to a thin sloppy ration for a few days until the condition clears up. Endeavor to remove the cause whatever it may be. Consult a veterinarian in order to eliminate the possibility of an infectious disease.

## OTHER CONDITIONS

### INJURIES FROM TEETH OF SUCKLING PIGS (NEEDLE TEETH)

Pigs are born with black, or so-called needle, teeth. These are perfectly normal. They are often the cause of irritation or pain to the sow, especially at first when the udders are sore to the touch. These needle teeth should be cut off before the pigs are placed with the sow to nurse. Do not attempt to break the teeth off. Use sharp, side-cutting pliers and cut about halfway between the jaw and the point of the tooth.

## POISONING

Poisoning in swine is a common occurrence. There are several forms in which the symptoms resemble those of hog cholera, but practically all cases of poisoning are devoid of fever.

**CAUSES.**—Hogs may be poisoned by spoiled feeds, the feeding of garbage containing washing compounds, lye, other caustics or irritating substances, by drinking salt brine, or by having access to a disinfectant carelessly left around, such as carbolic acid, bichloride of mercury, or cresylic disinfectants. Poisoning may result also from feeding on such plants as waterhemlock, cocklebur, wild cherry, and the deadly nightshade. If cottonseed meal is fed in excess of 9 percent of the total ration there is danger of injuring the hogs.

**SYMPTOMS.**—Salt brine, lye, and mercury poisoning produce fairly similar symptoms such as thirst, restlessness, lack of appetite, colicky pains, vomiting, muscular weakness, and at times paralysis. Salt brine causes frequent urination in addition to the symptoms mentioned. Cottonseed-meal injury gives rise to irregular appetite, thumps, unthriftiness, weakness, unsteady gait, and in severe cases, blindness. These symptoms are probably due to vitamin A deficiency.

Symptoms caused by plant poisoning are as follows:

**Waterhemlock:** Nervousness, muscular twitching, severe convulsions, and death.

**Cocklebur:** Depression, vomiting, staggering, and labored breathing; death follows within a few hours.

**Wild cherry:** Sluggishness, staggering, labored breathing, convulsions, and death.

**Deadly nightshade:** Nausea, vomiting, labored breathing, excitement, and convulsions.

One or more of the sick or dead hogs should be autopsied by a veterinarian. If lesions and history point to poisoning, remove the hogs to a safe place until the poison, plant, or mineral is removed. The veterinarian also may recommend specific medication.

**OVERHEATING (HEATSTROKE)**

Overheating is a common occurrence in swine during hot weather.

**CAUSE.**—This condition may result either from exposure to sun or from extreme exertion. The nature and conformation of this class of animals make them quite susceptible to such a condition.

**SYMPTOMS.**—Hogs will show signs of overheating rather suddenly. The animals apparently will gasp for breath, grow restless for a few minutes, wabble in their walk, and finally fall over on their sides, going into convulsions. The body temperature is extremely high, in some cases having been known to rise above 110° F. Hogs in an overheated condition need prompt attention if they are to be saved.

**PREVENTION AND TREATMENT.**—Carelessness on the part of some one, of course, is responsible for the overheating of hogs, for the animals will not remain in the hot rays of the sun or exercise unduly in extremely hot weather unless they are compelled to do so. Swine should be provided with plenty of shade both in the hog lot and in the pasture. In the absence of natural shade some artificial shade should be provided. A concrete wallow may also be provided. It should be drained and cleaned frequently. A thin layer of oil added to the water is useful to control lice infestation. When an animal shows signs of heat prostration, cold water should be poured on the head, but not over the entire body. This should be kept up until the animal revives.

**SPASMS AND CONVULSIONS**

Spasms and convulsions characterized by general restlessness, muscular tremblings, loss of appetite, vomiting, staggering gait, jerking of the head and legs, and loss of consciousness, may occur as a result of concussion of the brain, lightning, heatstroke, worm infestation, food poisoning, diseases of the brain, diseases of the kidneys, anemia, intestinal disturbances, stomatitis, and specific diseases such as swine erysipelas, hog cholera, Aujeszky's disease and listerellosis.

Treatment will depend entirely upon the cause and usually requires diagnosis by a veterinarian.

In many sections of the swine-raising States attempts are made to ship diseased hogs to market instead of giving them proper attention and treatment. Not only may the animals in such illegal shipments die in transit, but they may communicate disease to previously uninfected hogs.

Federal and State regulations are intended to prohibit the moving of diseased swine from one point to another.

If any symptoms in the herd indicate the onset or the presence of a serious communicable disease, the owner should notify a local practicing veterinarian, the State veterinarian, or an official of the State livestock sanitary association.

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